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ABSTRACT

This paper describes a qualitative research that used small group discussion activities centered in biotechnology and genetics controversies as a contribution to the promotion of students' thinking tools. Students' written conclusions and reflections about the activities, teachers' interviews, participant observation of the classes, and their transcripts constituted the data sources for this study. Some implementation results of such activities stressed the importance of social interactions and sociocognitive conflicts on children's cognitive, social and affective development. Teachers and pupils involved in this study thought that the actualness and controversy of genetic engineering related issues, associated with a class climate of interaction, respect and tolerance, fostered student learning and enthusiasm for classroom activities. Students that normally had a poor engagement on classroom activities enrolled actively in the debate. This study intends to be a starting point to more investigations. (Author)

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The Discussion of Biotechnology Controversial Issues - An Exploratory Study about its Potentialities

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ABSTRACT

This paper describes a qualitative research that used small group discussion activities centred in biotechnology and genetics controversies as a contribution to the promotion of studentsí thinking tools. Studentsí written conclusions and reflections about the activities, teachers interviews, participant observation of the classes, and their transcripts constituted the data sources for this study. Some implementation results of such activities stressed the importance of social interactions and sociocognitive conflicts on childrenís cognitive, social and affective development. Teachers and pupils involved in this study thought that the actualness and controversy of genetic engineering related issues, associated with a class climate of interaction, respect and tolerance, fostered student learning and enthusiasm for classroom activities. Students that normally had a poor engagement on classroom activities enrolled actively in the debate. This study intends to be a starting point to more investigations.

OBJECTIVES

We live in a world characterised by an amazing scientific and technologic progress. As result of such progress, much of what is taught in school will be overtaken in a few years. Consequently, itís essential that both teachers and pupils must be able to question, reflect, change and create.

This paper describes a qualitative research that evaluated the potentialities of small group discussion activities centred in biotechnology and genetics controversies on the promotion of studentsí thinking tools.

INTRODUCTION

Several researches in the Social Psychology area have stressed the potentialities of the interaction between peers in the cognitive development of individuals (Doise, Mugny & Perret-Clermon, 1975; Gilly, Fraisse & Roux, 1988; Perret-Clermont, Perret & Bell, 1991; César, 1994).

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For Doise, Mugny and Perret-Clermont the psychosocial factors play a decisive role in the sociocognitive development, in the appropriation of knowledge and in the acquisition and development of skills. For those researchers the key of this progress is the occurrence of sociocognitive conflicts among the elements of the group of work, that is, the interpersonal confront of different ideas (Doise, Mugny & Perret-Clermont, 1975; Mugny & Doise, 1978; Perret-Clermont, 1979). The existence of different perspectives between the peers gives rise to a double unbalance: an interpersonal and momentary unbalance by the fact that the presented answers are different, and an intrapersonal one, by the awareness of other existing answers, which raises doubts over their own answer. To overcome this impasse, children have simultaneously to analyse the dissenting points of view - which implies the existence of minimum notions over the subject in question - and to manage the interpersonal relationships within the group, with the purpose of reaching an agreement.

STUDY STAGES

The study includes 3 stages:

A first one, of conception of discussion activities, implied the selection of the topics and their presentation in both a controversial and motivating way, able to start the discussion among the students.

In a second stage of preparation of the study, both the school and the classes involved were selected (7 classes corresponding to 5 teachers and 118 students). Besides this, preparing meetings with the participating teachers took place, so that the activities to perform could be chosen and also to analyse and debate in detail the instruments of research and the scientific and ethical aspects of the issues of the different tasks. In a total of 20 analysed activities 5 were selected according to their eventually motivating power and relevance for the lectured subjects.

Finally, in the realisation stage, the instruments of research, previously selected, analysed and discussed, were used. In this third stage each teacher co-ordinated the five discussion activities in his particular classes.

At the end of the first and the fourth discussion activities each student received a questionnaire in order to evaluate the activities. This questionnaire was filled in at home and given back to the teacher in the next class.

The researcher observed 3 sessions in each class, according to his availability and classes timetable.

After the conclusion of the whole sequence of activities, semi-structured interviews were made to each of the teachers involved in the research.

THE DISCUSSION ACTIVITIES

The discussion activities in group were conceived by the researcher with several purposes:

1. To motivate participation and to engage the students in school activities based on the contents of several subjects of secondary schools.

2. To encourage a climate of class interaction capable of promoting:

    a. the construction of scientific and metascientific knowledge about recent advances in Biotechnology and Genetic areas;

    b. the development of cognitive skills; and

    c. the development of socio-affective skills.

It is considered that this controversial and up-to-date theme will be able to motivate the students and to promote reflection and debate. Such themes like Genetics and Biotechnology prove to be useful in a kind of teaching/learning process based on the interaction within the class and on the reflection and critical evaluation of the relations between Science, Technology and Society.

Each activity would imply two lessons: the first one intended for the discussion of the topic by the different groups and the second intended for a general debate directed by the teacher and performed by the whole class. The five activities were integrated in a previously defined sequence of 11 lessons. These included a first session for the introduction to the topic Science/Technology/Society, the distribution of informative texts about each of the issues to be discussed (genetic engineering, genetic screening, eugenics), the introduction on the purposes and methodology to be used and the organisation of students' groups.

The discussion of the topics took place according to the "Six Thinking Hats" method, proposed by de Bono (1985, 1995). This method is based on the assumption that thinking is most useful when performed by sectors, that is, in a compartmentalised way. Each hat has a different colour corresponding to a kind of reasoning:

> White hat: Facts, numbers and information. What information do we have? What information do we need?
>
> Red hat: Emotions, feelings, tips, hunches. What do we feel about this question?
>
> Black hat: Caution. Points out the problems, the weaknesses, the dangers of an idea. Does it work? Is it safe? Is it practicable?
>
> Yellow hat: Advantages, benefits. Which are the benefits? What is the advantage of doing it?
>
> Green hat: Exploration, suggestions, new ideas. Constructive ideas. Alternatives to action. What can we do here? Are there any different ideas?
>
> Blue hat: Thinking about the act of thinking. Thinking process control. How do we evaluate the stage where we are? To establish a new step for thinking.

This methodology comes up as an instrument of attention guidance for several thinking modes. It helps to minimise confusion and to discipline thinking. The use of the "Six Thinking Hats" besides constituting a way of potencializing the group discussion, aims at giving students a model of decision making, which will enable them to perform personal choices through the analysis of situations, the clarification of their values and the

evaluation of their options' consequences.

The subject of each activity was discussed according to a predetermined sequence of "Thinking Hats" appropriate to the exploitation of the situation concerned. Each hat could only be used during a maximum period of 5 minutes. Groups of 4 to 5 students were organised by the students themselves, showing heterogeneity related to gender and ethnic features. The role of the teacher during the activity consisted of the following: a) to motivate and to sensitise the students about the subject in question; b) to dynamize all the students to take part in the discussion; and c) to involve every student in the clarification of any doubts presented by the groups.

SOME STUDY RESULTS

These activities proved to be motivating and most effective in stimulating social interaction in the classroom. The formative aspects of discussion activities fostering the construction and the understanding of knowledge relevant to life - about recent advances in the area of Biotechnology and Genetics and their interactions with society - were evident.

The key to this progress was due to the sociocognitive conflict among the different elements of the discussion groups. The jointly analysis of different points of view facilitated the exchange of information, the clarification of doubts, the construction of knowledge about the items concerned and the alteration of the original reasoning through the discovery of possible logical inconsistencies. This opened up discussions on the ethical issues linked to these topics that leads to the rethinking and revaluation of opinions and beliefs.

The catalyser for the whole process was the controversial content of the issue together with the possibility of being discussed in the classroom by students and teachers in an atmosphere of respect for individual values and validation of different opinions. The enormous potential of controversial subjects' discussion to motivate students and to stimulate thought and social interaction was confirmed: a potential worthy to be exploited in the classroom.

The results contradicted the commonly held opinion among teachers of the school that many students don't have the capacity to think: the quality of interactions held during the debate sessions showed considerable capacities of reasoning power. Probably the quality of thought on certain occasions is not only related to the fact that the appropriate capacities were correctly taught but primarily depends upon motivational factors raised by the issue and the methodology. In this case, in spite of the interest not being synonymous with efficiency, it assured the involvement in thinking and stimulated the interaction and learning with other people.

The behaviour and attitude of teachers, appealing to and trying to value students' opinions during the activities, in order to create an atmosphere of respect and tolerance, seemed to be decisive in the promotion of thought. The development of our way of thinking is perhaps more influenced by the behaviour of people surrounding us, and by the role that we are expected to represent during their activities, than by learning capacities instruction. Maybe people are more able to think when they have an opportunity and a reason to think; when they are surrounded by people engaged in thinking; and when their thoughts are accepted and encouraged in discussions based on mutual respect.

Another visible result from discussion activities was the improvement of relationships among the participants. The atmosphere of respect established and the prominent role given to students in managing interpersonal

relationships within the groups were considered crucial factors in improving the relationships among the people involved.

All these facts emphasise the importance of discussions about controversial issues and the influence of social interaction in the development of cognitive, social and affective skills.

Many students and teachers referred to the effectiveness of the "Six Thinking Hats" in supervising and organising thought as it diminishes confusion and prevents the negligence of crucial aspects. It seems that the quality of thought can be improved through the use of attention directing methods. However, it is hard to distinguish whether this effectiveness is a result of this "Six Thinking Hats" method or a result of students' interactions and learning accomplished through group discussions.

REFERENCES

César, M. (1994). *O papel da interacção entre pares na resolução de tarefas matemáticas: trabalho em díade vs. trabalho individual em contexto escolar* . Tese de doutoramento não publicada, Universidade de Lisboa, Departamento de Educação da Faculdade de Ciências, Lisboa.

de Bono, E (1985). *Six thinking hats* . London: Penguin Books.

de Bono, E. (1995). *Ensine os seus filhos a pensar* . Lisboa: Difusão Cultural.

Doise, W., Mugny, G. & Perret-Clermont, A.-N. (1975). Social interaction and the development of cognitive operations. *European Journal of Social Psychology , 5* , 367-383.

Gilly, M., Fraisse, J., & Roux, J.-P. (1988). Résolution de problèmes en dyades et progrès cognitifs chez des enfant de 11 à 13 ans: dynamiques interactives et socio-cognitives. In A.-N. Perret-Clermont e M. Nicolet (Eds.), *Interagir et connaître - enjeux et régulations sociales dans le développment cognitif* (pp. 73-92). Fribourg: Del Val.

Mugny, G., & Doise, W. (1978). Socio-cognitive conflict and structure of individual and collective performances. *European Journal of Social Psychology , 8* , 181-182.

Perret-Clermont, A.-N. (1979). *La construction de líintelligence dans líinteraction sociale* . Bern: Peter Lang.

Perret-Clermont, A.-N., Perret, J.-F. & Bell, N. (1991). The social construction of meaning and cognitive activity in elementary school children. In L. B. Resnick, J. M. Levine & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 41-62). Washington, D.C.: American Psychological Association.